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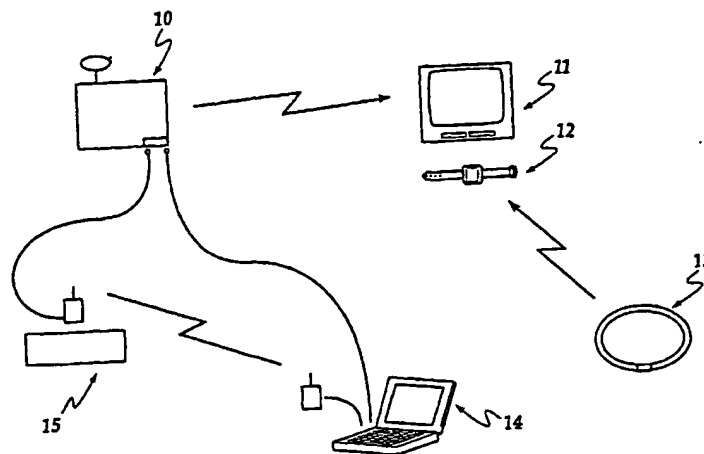
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(54) Title: **INFORMATION SYSTEM AND METHOD**



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(57) Abstract: A computer-based method of conditioning and/or training a participant for a sporting event is disclosed which includes storing in the computer desired performance data for a desired performance level in the sporting event; storing in the computer participant data which is related to a participant in the sporting event; developing from the stored data a conditioning and/or training schedule for the participant for the event, the schedule including a plurality of conditioning and/or training events; causing a participant to carry out the conditioning and/or training events; monitoring the participant's performance when carrying out the conditioning and/or training events, deriving training performance data relating thereto, and transmitting the training performance data to the computer; monitoring training event data relating to the conditioning and/or training events when being carried out by the participant and transmitting the training event data to the computer, and modifying the conditioning and/or training schedule and the plurality of conditioning and/or training events in response to the training performance data and training event data.



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COMPUTER-BASED SPORTS TRAINING OR CONDITIONING

Technical field

This invention relates to information systems and methods.

5 The invention has particular but not exclusive application to performance information systems and methods which provide information in real time and involve remote monitoring and sensing of parameters relevant to the performance.

10 The invention has more particular application to information systems and methods relating to the conditioning and/or training and/or performance of participants in sporting events or the like, and to systems and methods in which a global positioning satellite (GPS) system is utilised.

The invention also has application to information systems and methods for monitoring vehicle activity.

15 The invention also has application to information systems and methods for use in the horse racing industry.

Background of Invention

It is known to remotely sense parameters relating to performance and to provide wireless based information systems based on the material sensed. GPS systems are also now well known.

20 Summary of Invention

The present invention aims to provide an alternative to known information systems and methods.

This invention in one aspect resides broadly in a computer-based method of conditioning and/or training a participant for a sporting event, the method including:-

25 storing in the computer desired performance data for a desired performance level in the sporting event;

storing in the computer event data which is related to the sporting event;

storing in the computer participant data which is related to a participant in the sporting event;

30 developing from the stored data a conditioning and/or training schedule for the participant for the event, the schedule including a plurality of conditioning and/or training events;

causing a participant to carry out the conditioning and/or training events;

monitoring the participant's performance when carrying out the conditioning and/or training events, deriving training performance data relating thereto, and transmitting the training performance data to the computer;

35 monitoring training event data relating to the conditioning and/or training events when being carried out by the participant and transmitting the training event data to the computer, and

modifying the conditioning and/or training schedule and the plurality of conditioning and/or training events in response to the training performance data and training event data.

It is preferred that the method also includes:-

40 monitoring participant training data relating to the participant when carrying out the conditioning and/or training events and transmitting the participant training data to the computer, and

modifying the conditioning and/or training schedule and the plurality of conditioning and/or training events in response to the participant training data.

It is also preferred that the training event and training performance data is monitored by utilising a GPS system.

In another aspect this invention resides broadly in a computer-based system for conditioning and/or training a participant for a sporting event, the system including:-

- 5 storage means for storing desired performance data for a desired performance level in the sporting event;
- storage means for storing event data which is related to the sporting event;
- storage means for storing participant data which is related to a participant in the sporting event;
- 10 program means for developing from the stored data a conditioning and/or training schedule for the participant for the event, the schedule including a plurality of conditioning and/or training events;
- monitor means for monitoring the participant's performance when carrying out the conditioning and/or training events, and deriving training performance data relating thereto;
- monitor means for monitoring training event data relating to the conditioning and/or training events when being carried out by the participant;
- 15 transmission means for transmitting the training performance data and the training event data to the computer, and
- program means for modifying the conditioning and/or training schedule and the plurality of conditioning and/or training events in response to the training performance data and training event data.

In another aspect this invention resides broadly in a computer-based method of fitness evaluation, the method including:-

- storing in the computer desired performance data for a desired fitness level;
- storing in the computer training activity data which is related to a plurality of training activities;
- storing in the computer participant data which is related to a participant in the fitness evaluation;
- 25 developing from the stored data a fitness evaluation test to evaluate the fitness of the participant and a preliminary conditioning and/or training schedule for the participant, the schedule including a plurality of conditioning and/or training events; .
- causing a participant to carry out the fitness evaluation test;
- monitoring the participant's performance when carrying out the test, deriving test performance data relating thereto, and transmitting the test performance data to the computer;
- 30 monitoring participant test data relating to the participant when carrying out the test and transmitting the participant test data to the computer, and
- modifying the preliminary conditioning and/or training schedule and the plurality of conditioning and/or training events in response to the test performance data and participation test data.

In another aspect this invention resides broadly in computer-based system for fitness evaluation, the system including:-

- 35 storage means for storing desired performance data for a desired fitness level;
- storage means for storing training activity data which is related to a plurality of training activities;
- storage means for storing participant data which is related to a participant in the fitness evaluation;
- 40 program means for developing from the stored data a fitness evaluation test to evaluate the fitness of the participant and a preliminary conditioning and/or training schedule for the participant, the schedule including a plurality of conditioning and/or training events;
- monitor means for monitoring the participant's performance when carrying out the test;
- program means for deriving test performance data relating thereto;

monitor means for monitoring participant test data relating to the participant when carrying out the test;

transmission means transmitting the test performance data and the participant test data to the computer, and

5 program means for modifying the preliminary conditioning and/or training schedule and the plurality of conditioning and/or training events in response to the test performance data and participant test data.

In another aspect this invention resides broadly in a computer-based method of fitness evaluation, conditioning and/or training a sporting participant, the method including:-

10 monitoring the participant's performance in a sporting event, deriving training performance data relating thereto, and transmitting the training performance data to the computer;

monitoring event data relating to the sporting event when carried out by the participant and transmitting the event data to the computer, the event data including relative humidity and dry bulb temperature, and

15 evaluating fitness or developing a conditioning and/or training schedule in response to the training performance data and the training event data;

wherein the evaluating includes assessing ambient temperature from the event data.

In another aspect this invention resides broadly in a computer-based system for fitness evaluation, conditioning and/or training a sporting participant, the system including:-

20 monitor means for monitoring the participant's performance in a sporting event, deriving training performance data relating thereto;

monitor means for monitoring event data relating to the sporting event when carried out by the participant, the event data including relative humidity and dry bulb temperature;

transmission means for transmitting the event data and the training performance data to the computer;

25 program means for evaluating fitness or developing a conditioning and/or training schedule in response to the training performance data and the training event data;

wherein the program means assesses ambient temperature from the event data.

In another aspect this invention resides broadly in a computer-based method of conditioning and/or training a race horse in accordance with a training schedule, the method including:-

30 causing the horse and/or its rider to carry a GPS receiver during training;

transmitting to the computer performance data indicative of the performance of the horse during training;

storing the transmitted data in the computer;

35 comparing the transmitted data with previously stored data relating to the horse, and

modifying a training schedule for the horse in accordance with the comparison.

It is preferred that the data indicative of the performance of the horse includes data relating to speed and/or acceleration at discrete time intervals and/or distances.

In another aspect this invention resides broadly in a computer-based system for conditioning and/or training a race horse in accordance with a training schedule, the system including:-

40 a GPS receiver adapted to be carried by a horse during training;

transmission means for transmitting to the computer performance data indicative of the performance of the horse during training;

storage means for storing the transmitted data, and

program means for comparing the transmitted data with previously stored data relating to the horse and modifying a training schedule for the horse in accordance with the comparison.

In another aspect this invention resides broadly in a method of training a jockey to judge pace when riding in a horse race, the method including:-

- 5 causing the horse and/or the jockey to carry a GPS receiver during training and/or in a race; monitoring the speed and/or acceleration of the horse by means of the GPS receiver, and informing the jockey in real time to the jockey the speed and/or acceleration of the horse.

The jockey could be informed of the speed by an automated voice message. Alternatively the speed and/or acceleration is displayed to the jockey by visual display means worn by the jockey.

- 10 In another aspect this invention resides broadly in an apparatus for training a jockey to judge pace when riding in a horse race, the apparatus including:-

a GPS receiver adapted to be carried by the horse and/or the jockey during training and/or in a race;

- 15 monitor means for monitoring the speed and/or acceleration of the horse by utilising a GPS system, and information means for informing the jockey in real time the speed and/or acceleration of the horse.

In another aspect this invention resides broadly in a computer-based method of providing information on the form of racehorses, the method including:-

- 20 storing in a computer a form schedule containing data relating to the form of a horse; causing horses and/or their riders to carry a GPS receiver during training and/or in a race; transmitting to the computer performance data indicative of the performance of the horse during training and/or in the race; storing the transmitted data in a computer, and modifying the form schedule for the horse in accordance with the transmitted performance data.

- 25 In one embodiment the performance data is transmitted to a central computer accessible to authorised users. Preferably the central computer is accessible to authorised users via a user pay web site.

In another embodiment the performance data is directly transmitted to the computers of authorised users.

- 30 In another aspect this invention resides broadly in a computer-based system for providing information on the form of racehorses, the system including:-

storage means in a computer for storing a form schedule containing data relating to the form of a horse;

- 35 a GPS receiver adapted to be carried by horses and/or their riders during training and/or in a race; transmission means for transmitting to the computer performance data indicative of the performance of the horse during training and/or in the race, and

program means for modifying the form schedule for the horse in accordance with the transmitted performance data.

In another aspect this invention resides broadly in a computer based method of determining the relative proportion of private and business related usage of a motor vehicle, the method including:-

- 40 positioning a GPS receiver in the vehicle; indicating whether a vehicle journey is private or business related; transmitting to the computer usage data indicative of distance travelled and of the type of usage; storing the transmitted data in the computer, and

progressively accumulating the total distance travelled by the vehicle for both private usage and business usage.

In another aspect this invention resides broadly in a computer based system for determining the relative proportion of private and business related usage of a motor vehicle, the method including:-

- 5 a GPS receiver adapted to be positioned in the vehicle;
- indicating means for indicating whether a vehicle journey is private or business related;
- transmission means for transmitting to a computer usage data indicative of distance travelled and of the type of usage;
- storage means in the computer for storing the transmitted data, and
- 10 program means for progressively accumulating the total distance travelled by the vehicle for both private usage and business usage.

Description of Drawings

15 In order that this invention may be more easily understood and put into practical effect, reference will now be made to the accompanying drawings which illustrate a preferred embodiment of the invention, wherein:-

- FIG 1 is a schematic block diagram of the system in accordance with one aspect of the invention;
- FIG 2 is a schematic block diagram illustrating the personal unit of the system seen in FIG 1;
- 20 FIG 3 is a flow chart illustrating the software routines executed by the controller within the personal unit seen in FIG 2;
- FIG 4 is a schematic block diagram illustrating the communication unit of the system seen in FIG 1, and
- FIG 5 is representative of visual displays provided in accordance with the invention and plots heart rate against speed during a training session.

25

Description of Preferred Embodiment of Invention

It will be appreciated from the above "Summary of the Invention" that the present invention resides in several aspects including:

- 30 . Information systems and methods of developing a training or conditioning regime relating either to a specific sporting event, or generally.
- . Information systems and methods of fitness evaluation.
- . Information systems and methods of conditioning in which ambient temperature rather than dry bulb temperature is utilised.
- 35 . Information systems and methods for use in the horse racing industry including applications for producing form guide services, for horse training and for jockey training, and
- . Information systems and methods for determining the proportion of private to business-related motor vehicle usage.

40 The present invention relates generally to a micro controlled system which displays heart rate, speed, distance and time/distance or any other sports related information to a user. The system has include a GPS receiver and a means for transferring the measurements to a personal computer either real-time or post session. Full analysis of the data is available via a software program installed on a PC. Real-time data is also available to third parties such as web sites or TV stations.

It will be appreciated that a GPS system is a preferred feature of some aspects of the invention and that the invention is particularly suited to sporting applications. Consequently the applicant has coined the expression GPSport to refer to the invention in general terms and the expression is used in the specification in this general sense. It is however not to be construed as limiting in any way.

5 FIG 1 illustrates the main system components which constitute a preferred embodiment of the invention, in which GPSport personal unit 10 is attached to a user or to a vehicle and transmits velocity and position information, generated preferably by utilising a GPS system, to display devices such as a TV screen 11 or watch 12, is downloadable to PC 14 and connects to a GPSport link or transmitter 15 which also transmits to PC 14. Heart rate monitor and wireless ECG 13 transmit to display devices 11 and 12.

GPSport personal unit 10 and GPSport transmitter link 15 are described in more detail with reference to FIGS 2 and 4 respectively.

Turning now to FIG 2, personal unit 10 is designed to be small and light weight and to be attached to the users arm or back. Personal unit 10 has an on board processor, either sharing this with the GPS engine or being a stand alone component. The processor converts raw GPS data and any other recorded information to a form suitable to the user. Velocity for example may be converted to Km/h, m/s, or Time/Set Distance. The processor then passes the information to display devices 11 and 12. The miniature high performance GPS engine is capable of tracking the user to a reference anywhere on the earth and provides raw location and velocity data along with altitude if require.

20 Program memory is preferably in non volatile form such as flash memory and contains the machine executable code. The system is capable of application upgrades via a PC to allow for additional features or modifications to the application if required at a later stage.

Storage memory holds the information logged during a session and operates in similar manner to a hard drive on a PC.

25 Profile memory holds any profiles (pre planned sessions) downloaded into the unit.

Configuration memory contains the setup parameters for the system. Configuration items also include memory storage rates, power saving features and any other personal settings desired by the user. To change the configuration memory a user connects the unit to a PC via a download cable and then downloads a new set of configuration parameters using the configuration section of the PC
30 Analyser Software.

Additional sensors allow the system to record other information desired by the user. Examples include temperature and blood oxygen levels.

The line drivers convert the communications output levels of the processor to those required by the PC or other device used for communicating with the unit.

35 The battery management system controls charging and discharging of the system battery. A battery gas gauge monitors the battery level allowing the user to know the current battery status at all times. Battery technologies can include Nicad Ni-mH or Lithium Ion. The charging chip may be internal or external and charging of the battery is via the unit connector. The charger is an intelligent charger suitable for the selected battery technology.

40 The connector on the unit is waterproof and contains the data links to the processor as well as provide charging and software uploading connections. The unit also contains an internal buzzer providing audio feedback to the user.

FIG 3 shows a flowchart representation of the major software routines executed by the controller within Personal unit 10 as follows:-

101 INIT:

- Upon power up the controller executes an initialization routine. The initialization sets all initial parameters required by the system both internal and external to the processor. Typical functions include GPS starting, memory setup and the detection of external sensors.

102 MODE SELECTION:

- Once initialized the controller looks at the mode pins and determine which mode it should run in. If normal mode is detected the GPS-personal continues to run in Normal mode. If docking mode is detected the application performs docking mode functions.

Normal Mode.**103 NEW DATA DETECTED:**

- In normal mode the controller continuously looks for the detection of new data. If new data is detected the controller will start to process the data.

20 104 CONVERT DATA TO USER REQUIREMENTS:

If new data is detected the data is processed and converted to a form requested by the user in the configuration parameters. Velocity for example might be converted to km/h or m/s or time to cover a certain distance.

25 105 SEND MODIFIED DATA TO DISPLAYS or COMMUNICATIONS LINK:

Once the data is converted to a usable form the information is passed to the display units. If a real time connection is required the data will also be sent to the communications port for transmission to the PC via a GPSport-Link.

30 106 STORE DATA

Depending on the configuration parameters the information received will be stored to the storage memory.

107 COMPARE CURRENT PERFORMANCE WITH PRELOADED PERFORMANCE

- In this module the current performance of the user is compared with a preloaded performance Audio or visual feedback will give the user an indication of their performance. The cycle will then repeat from 102.

Docking Mode**40****208 WAIT FOR COMMAND FROM PC.**

If docking mode is selected from 102 the controller will wait for a command from the PC.

209/210 APPLICATION UPDATE COMMAND:

If an application update command is received by the PC, the software on the controller will receive a new application and run the new application on completion of the load.

211/212 CONFIGURATION UPDATE:

- 5 If a request to update configuration parameters is made configuration parameters will be updated.

213/214 UPLOAD DATA:

If the PC sends upload data to the GPSport-Personal the device will store the contents of this memory to its profile memory.

10

215/216 DOWNLOAD DATA:

If data is requested to be downloaded to the PC the GPSport will send its storage memory contents to the PC.

- 15 217/218 OTHER DOCKING PROCEDURES:

If the PC requests the GPSport to perform other functions the GPSport will perform these. An example procedure could be clearing the memory.

20 Data routine Functions

301 MONITOR GPS AND ALL OTHER SENSORS:

This function involves the controller monitoring all sensors. The GPS for example could be monitored for the arrival of a new positional packet.

- 25 302 NEW DATA

This function looks at the data monitored in 201 and detects if there has been a change in the information. A change can be as simple as a new position packet from the GPS.

303

- 30 When a change in the information is detected a flag is set indicating to the main code the data is ready for processing.

35 With reference now to FIG 4 which illustrates the GPSport transmitter link 15 and which provides a wireless link between a GPSport-Personal unit 10 and PC 14 thus facilitating real-time solutions. One GPSport-Link attaches to a GPSport-Personal while the other connects to a PC with information transfer possible in both directions. The links utilise radio spread spectrum modems. The link attached to the GPSport-Personal unit is powered by an internal battery or alternatively power from the GPSport-Personal can be utilised. The GPSport-link may be an integral part of GPSport-personal unit 10 or can be a separate unit. FIG 4 shows the block diagram of GPSport-Link 15.

40 The display units 11 and 12 seen in FIG 1 can be of different form. Watch 12 has similar features to a normal wrist watch and in addition displays information passed from the GPSport-Personal. The watch may also have the ability to store data for later retrieval. Remote display 11 has similar features to watch 12 but offers a larger viewing screen. Alternatively the display integers can be an integral part of the GPS-personal unit.

Information displayed may include heart rate (H/R), speed, time/set distance, direction, and acceleration.

The Heart Rate Monitor 13 detects heart rate pulses and transmits these via radio frequencies for detection and display by the displays 11/12 and/or GPSport-Personal unit 10.

5 The software supporting the invention has functionality as follows:-

- Windows 95, 98, NT & 2000 compatible
- Wireless interface to the GPSport Personal/Horse/Athlete units for download of data
- Realtime and Post analysis
- Graphical planning of training schedules
- 10 · Comparative analysis of previous training sessions
- Integration into MS-Access Database

The software is capable of capturing the following data from any of the GPSport models:-

- Athlete position
- Start time (date/time)
- 15 · Velocity
 - a. speed & direction
 - b. km/hr, miles/hr
 - c. metres/second, furlong, speed/km or miles (eg. 4 minute km, etc)
- Intervals
- 20 · Training Profiles
 - a. Distance profiles (eg Marathon, triathlon, road cyclist, etc)
 - b. Standard health profiles (eg general fitness-walking, running, rollerblading, etc)
 - c. Pre-prepared profiles (eg upload training programs from elite athletes)
- Heart Rate

25 The data is downloadable to a PC via a radio frequency link as well as being able to upload pre-prepared training information to the GPSport model prior to going out to train.

The GPSport athlete model has the added functionality that will allow real time download and evaluation whilst the athlete is training. This allows the coach/user to capture the data immediately following the performance (eg 100m sprint) and all the above data will be available for evaluation real time allowing the coach/user to make error free decisions as to the performance characteristics during the previous training trial.

The software allows for the following data manipulation either pre or post sessions:-

- Comparison between HR and velocity
- Previous session comparisons
- 35 a. Overlay up to 10 previous sessions to compare performance improvement/decrement.
- Storage into a database for future reference
- Both graphical and numerical views available
- Graphical data can be manipulated to allow a user to capture a small portion of the session for speed/heart rate evaluation.
- 40

Thus as can be seen in FIG 5, the total distance of session can be viewed on a single graph and if required the user can select distinct sections of the total workout for interval evaluation. This allows the user to determine sections of the session that were above or below the performance they required. The session could be overlayed with a predetermined session that the user attempted to

complete, facilitating direct analysis and comparison and letting the user determine where in the session they either surpassed or failed to meet speed objectives.

5 The system provides for real time uploading to a web site/TV channel allowing for user information to be stored/viewed by any individual who has access to the specific URL/TV channel. The system provides real time feedback of athlete performance kinematics which is immediately available on a TV screen whilst the event is taking place.

In addition a general web site can promote and support the GPSport models in accordance with the invention. The web site includes information about GPSport, founders, mission, etc. The GPSport user can access an array of training information which is freely downloadable.

10 A separate section on the site is accessible only to subscribers to the GPSport system and permits the downloading of the latest software updates, download new training profiles, etc.

Another section of the web site is accessible by punters who wish to find out prior performance data of horses collected from previous races. This section is a user pay site with password protection.

15 The sites incorporate state of the art web development technologies including DHTML and Flash interface tools/effects, ASP/PHP development language, and SQL/MySQL backend database integration.

There now follows a brief description of the manner in which the various methods of the invention are implemented and used.

20

Training/Conditioning Regime

In use in this aspect of the invention, a computer-based method of conditioning and/or training a participant for a sporting event (such as for example a City to Surf race) stores in the computer desired performance data for a desired performance level in the sporting event (such as segmental times for various segments of the race), event data which is related to the sporting event (such as gradients and distances for different segments of the race, altitude, average temperatures, dates etc), and participant data which is related to a participant in the sporting event (such as basal heart rate, peak heart rate, weight etc). The computer is programmed to develop from the stored data a conditioning and/or training schedule for the participant for the event, the schedule including a plurality of conditioning and/or training events (such as date specific exercises, sprint repetitions – distance and time, weights program etc). The participant then carries out the conditioning and/or training events and a number of aspects of the training are monitored including the participants performance (such as time, speed, etc) and training event data relating to the conditioning and/or training events (such as altitude, temperature, distance, gradient etc). Training performance data relating to the training or conditioning is then derived and transmitted to the computer together with the training event data. The conditioning and/or training schedule and the training events are then modified by the computer in response to the training performance data and training event data received from a training session to generate a revised schedule.

40 As a software development tool this so-called planning wizard allows the user to complete personal information about themselves (age, sex, resting pulse, fitness level, exercise type, etc) and the wizard develops a series of training sessions with distance/speed/heart rate goals for the user to achieve.

For example, a user may wish to compete in the Sydney to Surf fun run in 2001 and the Wizard develops a training program that will help the user achieve their performance goal over that distance.

Monthly programs can be downloaded from the web site with a high profile/personality athlete's name attached to the program.

5 A time for the path to be taken can be preset so that at any time during the performance the individual knows if they are +/- the required speed to complete the course in the predetermined time with visual/auditory warnings being provided. The system can also download preset "training programs" that can be loaded into the unit allowing the user to follow preset programs in the preparation of a specific performance/event (eg city to Surf).

10 The GPSport Analyser Training Program wizard allows individual training programs to be developed for any type of athlete. This training program uses the results obtained by the Fitness Test Wizard to provide guidelines to sports teams, professional fitness trainers and health professionals. A history of the Athlete's fitness is maintained in a database that allows the Training program to be optimised. Environmental effects such as heat, humidity and altitude can be measured directly and analysed as part of the training regime.

15 Fitness Evaluation

In use in this aspect of the invention a computer-based method of fitness evaluation stores in the computer desired performance data for a desired fitness level (such as time to run a certain distance, recovery pulse rates etc), activity data which is related to a plurality of training activities (such as repetition sequences, times and speeds for certain training activities), and participant data which is related to a participant in the fitness evaluation (such as basal heart rate, peak heart rate, weight etc). The computer is programmed to develop from the stored data a fitness evaluation test to evaluate the fitness of the participant (such as the time to do certain activities, recovery pulse rates, peak pulse rates etc) and a preliminary conditioning and/or training schedule for the participant, the schedule including a plurality of conditioning and/or training events (such as exercises, sprint repetitions – distance and time, weights program etc on specific dates). The participant then carries out the fitness evaluation test and a number of parameters are monitored including the participant's performance (such as time, speed, etc) and participant test data relating to the participant carrying out the test (such as weight, heart rate etc). Test performance data relating to the evaluation is then derived and transmitted to the computer together with the participant test data. The preliminary conditioning and/or training schedule and the training events are then modified by the computer in response to the test performance data and participant test data received from an evaluation testing session to generate a revised schedule.

With the so-called fitness evaluation wizard completed by the user, the type and volume/intensity of exercise activity to be undertaken to reach chosen goals is determined. The training performance data can be downloaded and directly compared to what was required allowing the system to modify the program as needed (dependant upon how quickly/slowly the user adapts to the training). The system further includes a fitness evaluation test that can be loaded into the unit requiring the user to select the form of exercise and to then complete an exercise program directed by the GPSport unit. At the end of the testing session the information is downloaded to the PC where the GPSport Analyser will determine the appropriate levels of exercise that the user should attempt in their goal to improve fitness/prepare for a specific event, etc.

40 The GPSport Analyser Evaluator Software (Fitness Test software) allows the user to determine an appropriate progressive incremental fitness test (walk/jog/cycle, etc). This test will evaluate a user's current fitness levels and will then develop an appropriate fitness regime to suit the fitness and motivational demands of the current user.

In use in another aspect of the invention regarding fitness evaluation, conditioning and/or training a sporting participant, the participant's performance in a sporting event is monitored, training performance data relating thereto is derived, and the training performance data is transmitted to the computer. Event data relating to the sporting event when carried out by the participant is monitored and transmitting to the computer, the event data including relative humidity and dry bulb temperature, with evaluation of fitness or development of a conditioning and/or training schedule in response to the training performance data and the training event data involving an assessment of ambient temperature from the event data.

The GPSport unit is able to measure skin temperature which can be used as a measure of the physiological stress that is being placed upon a person's body throughout the physical activity being performed. The GPSport personal unit also measures environmental temperature and relative humidity allowing a calculation of ambient temperature (the temperature that takes into account the ability to reduce body heat through the process of sweating and evaporation).

In both the training and fitness evaluation aspects GPSport can modify a 1Hz model to allow athletes and fitness enthusiasts alike to capture real time data (via onboard memory) of maximum speed, average speed, distance covered as well as heart rate and also be able to download this information to a computer post exercise. The software supplied with this GPSport general population model allows the user to view tabular or graphical representations of the data, compare past results and plot future training sessions (average speeds to be achieved, maximal speeds at set intervals, etc). This unit provides an all-in-one performance evaluation solution to the sport or fitness enthusiast and avoids the requirement of having two or more separate products (eg Heart Rate Monitor, speedometer). Furthermore in many sports speed evaluation is not easily collected (eg distance running, rollerblading, orienteering, etc).

A 10-20Hz Model GPSport system allows the coach/athlete to collect much more detailed movement data. This device allows for data collection every $1/10^{\text{th}}$ - $1/20^{\text{th}}$ of a second (rather than every second in the 1Hz machines above). This allows for much more accurate speed and position of the athlete during training/performance. These devices are linked to a portable device (laptop, hand held PDA) that will be able to capture up to 10 athletes at once in real-time allowing the coach to have immediate feedback on time to distance, maximal speed and average speed. This data will be downloadable to a computer (PDA if required) and both tabular and graphical data can be viewed. The graphical data will also be able to be manipulated in that the user will be able to select start and finish positions on the graphs and this will give immediate maximal speed, average speed and distance values.

Horse Racing applications

In use in another aspect of the invention a race horse is trained or conditioned in accordance with a training schedule, by having the horse and/or its rider carry a GPS receiver during training. Performance data indicative of the performance of the horse during training (such as speed and acceleration and times) are transmitted to a computer and stored. The transmitted data is compared with previously stored data relating to the horse, and the training schedule for the horse modified in accordance with the comparison.

In use in another aspect of the invention a jockey is trained to judge pace when riding in a horse race by having the horse and/or the jockey carry a GPS receiver during training and/or in a race. The speed and/or acceleration of the horse are monitored by means of the GPS receiver, and the speed and/or acceleration of the horse displayed in real time to the jockey.

5 In use in another aspect of the invention in which information on the form of racehorses is provided, a form schedule containing data relating to the form of a horse is stored in a computer, horses and/or their riders carry a GPS receiver during training and/or in a race, and performance data indicative of the performance of the horse during training and/or in the race (such as segmental times, weights etc) are transmitted to the computer. The transmitted data is stored in the computer, and the form schedule for the horse then modified in accordance with the transmitted performance data.

The GPSport horse training assistance technology thus has a number of uses in the horse racing industry. These include:-

10 A 1Hz GPS device that can be used by jockeys to allow them to evaluate riding speed at all times during a training practice session (the unit will be worn by the jockey during training sessions).

The device can be upgraded to allow the trainer to collect all training results (maximum speed, average speed, distance covered, etc) and can be later downloaded to a computer for archiving allowing result comparisons from one day to the next or between horses.

15 A further upgrade allows jockeys and/or horses to wear the device during race day allowing data to be uploaded to a web site that can be accessible by subscribers (allowing more intelligent punting decisions).

20 The horse model varies from the Personal model in that the display is a high visibility device fitted to the horse's head for the jockey to see whilst riding; the device will not need to have such an important emphasis placed on the look and feel of the device; the heart rate monitor will be much larger to accommodate the girth of the horse; there will have to be two separate units (Heart Rate and GPS unit). The HR unit will be on the horse, the GPS will be on the jockey, and there will no need for a watch to capture/display information which will all be captured in the GPS unit itself.

Vehicle Usage

5 In use in another aspect of the invention the relative proportion of private and business related usage of a motor vehicle is determined by positioning a GPS receiver in the vehicle and indicating whether a vehicle journey is private or business related. Usage data indicative of distance travelled and of the type of usage is transmitted to the computer and stored. The computer progressively accumulates the total distance travelled by the vehicle for both private usage and business usage.

10 The GPSport basic unit can thus be placed in a vehicle and will automatically log travel usage each time the user uses the vehicle. The device includes 2 buttons (1-business travel, 2-private travel) and the user presses the appropriate button at the start of each trip and at the end of the required collection time the information can be downloaded to a PC with software that will quickly and easily allow the user to work out the percentage of business v's private use. Each time the unit is activated the day/date/time is captured and at the end of any trip if the vehicle is stationary for more than 10-15 minutes, the unit stores the information and resets itself for the next trip.

15 It will of course be realised that whilst the above has been given by way of an illustrative example of this invention, all such and other modifications and variations hereto, as would be apparent to persons skilled in the art, are deemed to fall within the broad scope and ambit of this invention as is herein set forth.

The claims defining the invention are as follows:-

1. A computer-based method of conditioning and/or training a participant for a sporting event, said method including:-
 - 5 storing in the computer desired performance data for a desired performance level in the sporting event;
 - storing in the computer event data which is related to the sporting event;
 - storing in the computer participant data which is related to a participant in the sporting event;
 - developing from the stored data a conditioning and/or training schedule for the participant for the
 - 10 event, said schedule including a plurality of conditioning and/or training events;
 - causing a participant to carry out said conditioning and/or training events;
 - monitoring the participant's performance when carrying out said conditioning and/or training events, deriving training performance data relating thereto, and transmitting said training performance data to the computer;
 - 15 monitoring training event data relating to said conditioning and/or training events when being carried out by the participant and transmitting said training event data to the computer, and
 - modifying said conditioning and/or training schedule and said plurality of conditioning and/or training events in response to said training performance data and training event data.
- 20 2. A computer-based method of conditioning and/or training a participant for a sporting event as claimed in claim 1, and including:-
 - monitoring participant training data relating to the participant when carrying out said conditioning and/or training events and transmitting said participant training data to the computer, and
 - 25 modifying said conditioning and/or training schedule and said plurality of conditioning and/or training events in response to said participant training data.
3. A computer-based method of conditioning and/or training a participant for a sporting event as claimed in claim 1, wherein said training event data and said training participant data is monitored by utilising a GPS system.
- 30 4. A computer-based system for conditioning and/or training a participant for a sporting event, said system including:-
 - storage means for storing desired performance data for a desired performance level in the sporting event;
 - 35 storage means for storing event data which is related to the sporting event;
 - storage means for storing participant data which is related to a participant in the sporting event;
 - program means for developing from the stored data a conditioning and/or training schedule for the participant for the event, said schedule including a plurality of conditioning and/or training events;
 - monitor means for monitoring the participant's performance when carrying out said conditioning
 - 40 and/or training events, and deriving training performance data relating thereto;
 - monitor means for monitoring training event data relating to said conditioning and/or training events when being carried out by the participant;
 - transmission means for transmitting said training performance data and said training event data to the computer, and

program means for modifying said conditioning and/or training schedule and said plurality of conditioning and/or training events in response to said training performance data and training event data.

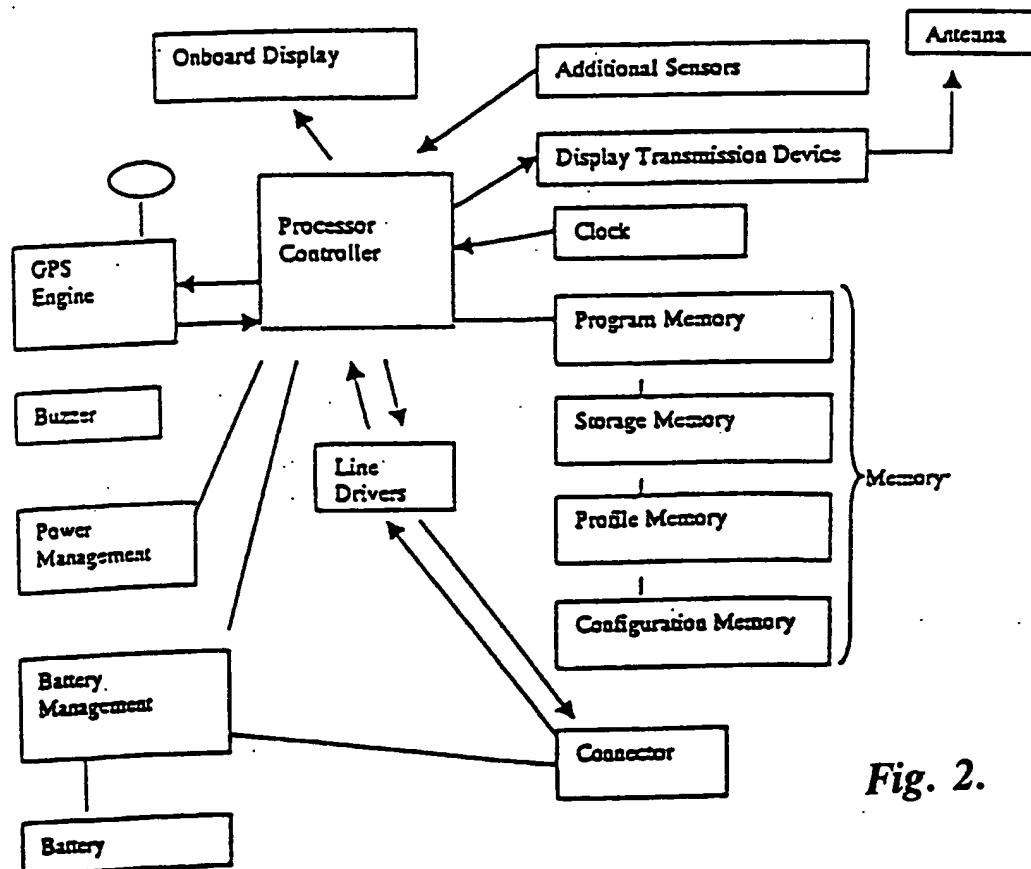
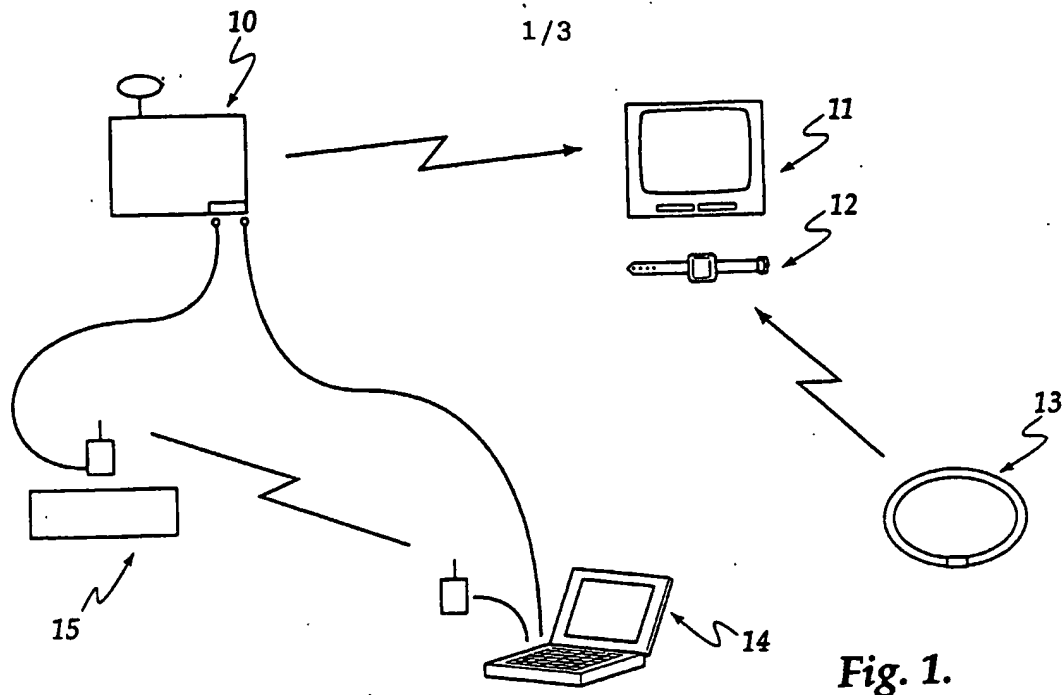
5. A computer-based method of fitness evaluation, said method including:-
 - 5 storing in the computer desired performance data for a desired fitness level;
 - storing in the computer training activity data which is related to a plurality of training activities;
 - storing in the computer participant data which is related to a participant in the fitness evaluation;
 - developing from the stored data a fitness evaluation test to evaluate the fitness of the participant and a preliminary conditioning and/or training schedule for the participant, said schedule including a plurality
 - 10 of conditioning and/or training events;
 - causing a participant to carry out said fitness evaluation test;
 - monitoring the participant's performance when carrying out said test, deriving test performance data relating thereto, and transmitting said test performance data to the computer;
 - monitoring participant test data relating to the participant when carrying out said test and
 - 15 transmitting said participant test data to the computer, and
 - modifying said preliminary conditioning and/or training schedule and said plurality of conditioning and/or training events in response to said test performance data and participant test data.
6. A computer-based system for fitness evaluation, said system including:-
 - 20 storage means for storing desired performance data for a desired fitness level;
 - storage means for storing training activity data which is related to a plurality of training activities;
 - storage means for storing participant data which is related to a participant in the fitness evaluation;
 - program means for developing from the stored data a fitness evaluation test to evaluate the fitness of the participant and a preliminary conditioning and/or training schedule for the participant, said schedule
 - 25 including a plurality of conditioning and/or training events;
 - monitor means for monitoring the participant's performance when carrying out said test;
 - program means for deriving test performance data relating thereto;
 - monitor means for monitoring participant test data relating to the participant when carrying out said
 - 30 test;
 - transmission means transmitting said test performance data and said participant test data to the computer, and
 - program means for modifying said preliminary conditioning and/or training schedule and said plurality of conditioning and/or training events in response to said test performance data and participant test data.
7. A computer-based method of fitness evaluation, conditioning and/or training a sporting participant, said method including:-
 - 35 monitoring the participant's performance in a sporting event, deriving training performance data relating thereto, and transmitting said training performance data to the computer;
 - 40 monitoring event data relating to said sporting event when carried out by the participant and transmitting said event data to the computer, said event data including relative humidity and dry bulb temperature, and
 - evaluating fitness or developing a conditioning and/or training schedule in response to said training performance data and said training event data;

wherein said evaluating includes assessing ambient temperature from said event data.

8. A computer-based system for fitness evaluation, conditioning and/or training a sporting participant, said system including:-
- 5 monitor means for monitoring the participant's performance in a sporting event, deriving training performance data relating thereto;
- monitor means for monitoring event data relating to said sporting event when carried out by the participant, said event data including relative humidity and dry bulb temperature;
- 10 transmission means for transmitting said event data and said training performance data to the computer;
- program means for evaluating fitness or developing a conditioning and/or training schedule in response to said training performance data and said training event data;
- wherein said program means assesses ambient temperature from said event data.
- 15 9. A computer-based method of conditioning and/or training a race horse in accordance with a training schedule, said method including:-
- causing the horse and/or its rider to carry a GPS receiver during training;
- transmitting to the computer performance data indicative of the performance of the horse during training;
- 20 storing said transmitted data in the computer;
- comparing the transmitted data with previously stored data relating to the horse, and modifying a training schedule for the horse in accordance with the comparison.
10. A computer-based method of conditioning and/or training a race horse as claimed in claim 9, wherein said data indicative of the performance of the horse includes data relating to speed and/or acceleration at discrete time intervals and/or distances.
- 25 11. A computer-based system for conditioning and/or training a race horse in accordance with a training schedule, said system including:-
- 30 a GPS receiver adapted to be carried by a horse during training;
- transmission means for transmitting to the computer performance data indicative of the performance of the horse during training;
- storage means for storing said transmitted data, and
- program means for comparing the transmitted data with previously stored data relating to the horse
- 35 and modifying a training schedule for the horse in accordance with the comparison.
12. A method of training a jockey to judge pace when riding in a horse race, said method including:-
- causing the horse and/or the jockey to carry a GPS receiver during training and/or in a race;
- 40 monitoring the speed and/or acceleration of the horse by utilising a GPS system, and informing the jockey in real time the speed and/or acceleration of the horse.
13. A method of training a jockey to ride a horse in a race as claimed in claim 12, wherein the speed and/or acceleration is displayed to the jockey by visual display means worn by the jockey.

14. Apparatus for training a jockey to judge pace when riding in a horse race, said apparatus including:-
a GPS receiver adapted to be carried by the horse and/or the jockey during training and/or in a race;
5 monitor means for monitoring the speed and/or acceleration of the horse by utilising a GPS system, and
information means for informing the jockey in real time the speed and/or acceleration of the horse.
15. A computer-based method of providing information on the form of racehorses, said method including:-
10 storing in a computer a form schedule containing data relating to the form of a horse;
causing horses and/or their riders to carry a GPS receiver during training and/or in a race;
transmitting to the computer performance data indicative of the performance of the horse during training and/or in the race;
15 storing said transmitted data in a computer, and
modifying the form schedule for the horse in accordance with the transmitted performance data.
16. A computer-based method of providing information on the form of racehorses as claimed in claim 15, wherein said performance data is transmitted to a central computer accessible to authorised users.
20
17. A computer-based method of providing information on the form of racehorses as claimed in claim 16, wherein said central computer is accessible to authorised users via a user pay web site.
18. A computer-based method of providing information on the form of racehorses as claimed in claim 15, wherein said performance data is directly transmitted to the computers of authorised users.
25
19. A computer-based system for providing information on the form of racehorses, said system including:-
30 storage means in a computer for storing a form schedule containing data relating to the form of a horse;
a GPS receiver adapted to be carried by horses and/or their riders during training and/or in a race;
transmission means for transmitting to the computer performance data indicative of the performance of the horse during training and/or in the race, and
35 program means for modifying the form schedule for the horse in accordance with the transmitted performance data.
20. A computer based method of determining the relative proportion of private and business related usage of a motor vehicle, said method including:-
40 positioning a GPS receiver in the vehicle;
indicating whether a vehicle journey is private or business related;
transmitting to the computer usage data indicative of distance travelled and of the type of usage;
storing said transmitted data in the computer, and
progressively accumulating the total distance travelled by the vehicle for both private usage and business usage.

21. A computer based system for determining the relative proportion of private and business related usage of a motor vehicle, said method including:-
- 5 a GPS receiver adapted to be positioned in the vehicle;
- indicating means for indicating whether a vehicle journey is private or business related;
- transmission means for transmitting to a computer usage data indicative of distance travelled and of the type of usage;
- storage means in the computer for storing said transmitted data, and program means for progressively accumulating the total distance travelled by the vehicle for both private usage and
- 10 business usage.



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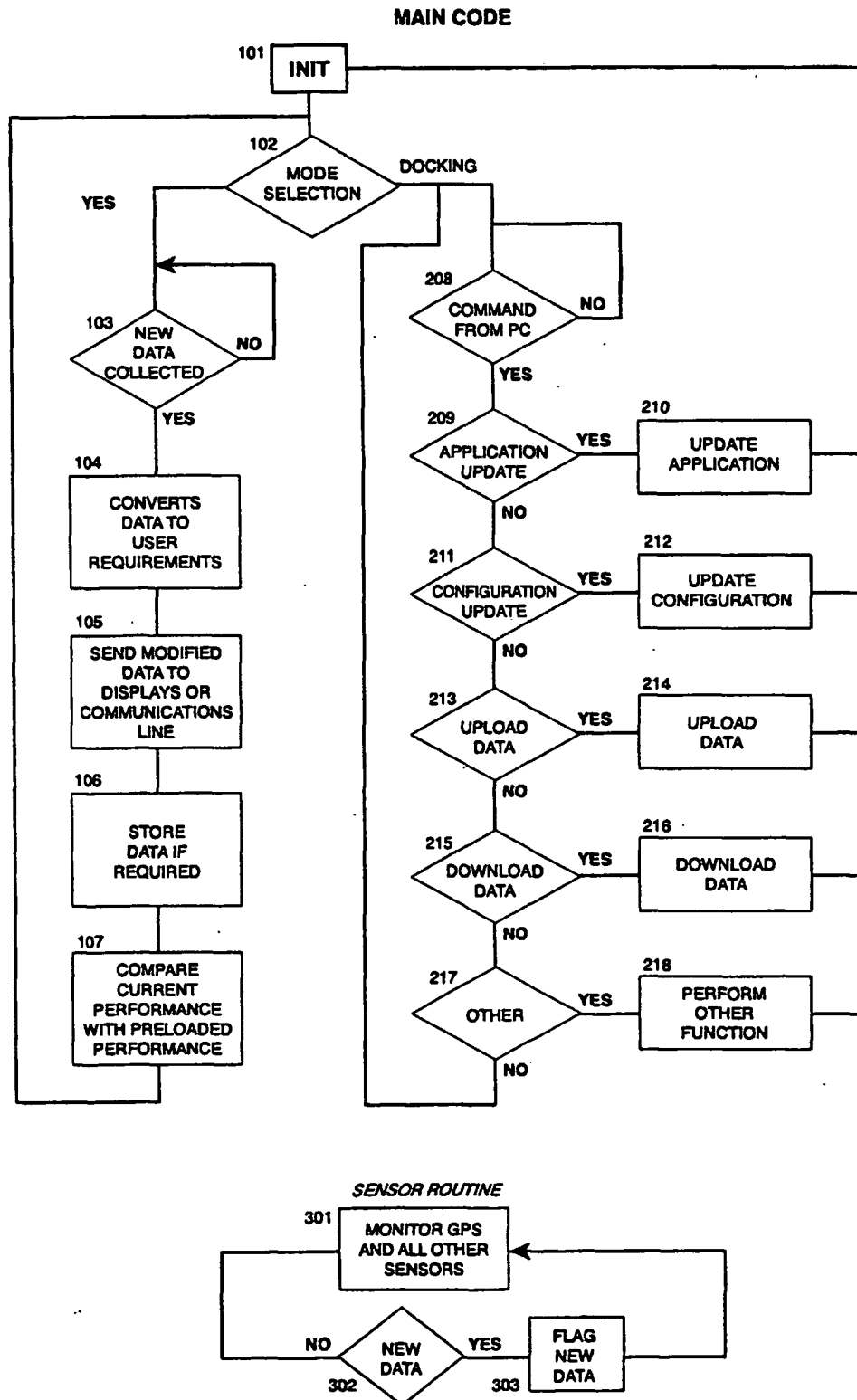
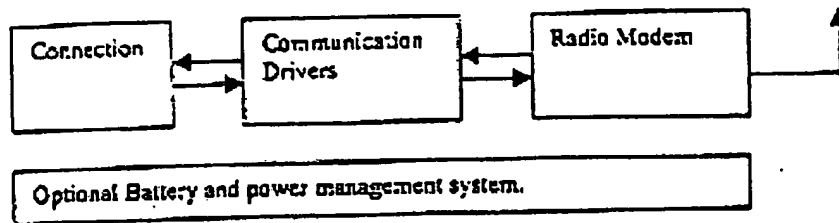
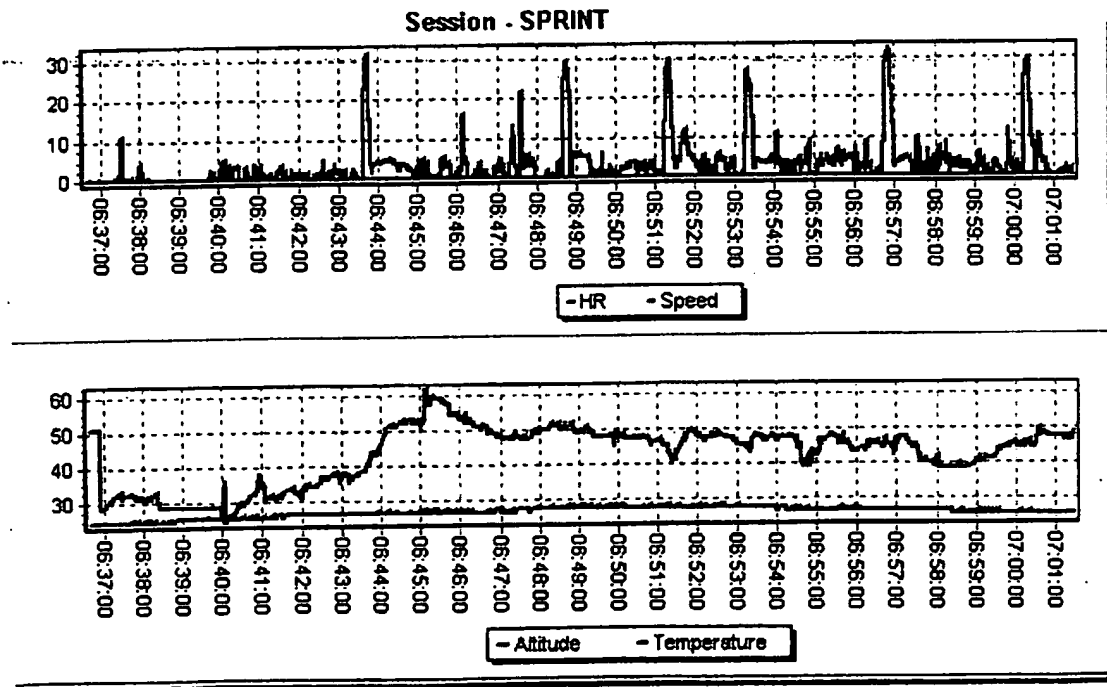


Fig. 3.

*Fig. 4.**Fig. 5.*

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU01/01430

A. CLASSIFICATION OF SUBJECT MATTER																						
Int. Cl. ⁷ : G06F 19/00																						
According to International Patent Classification (IPC) or to both national classification and IPC																						
B. FIELDS SEARCHED																						
Minimum documentation searched (classification system followed by classification symbols) G06F 19/00																						
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched																						
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)																						
C. DOCUMENTS CONSIDERED TO BE RELEVANT																						
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.																				
A	US 5410472 A (ANDERSON) 25 April 1995	1 - 11																				
A	US 5598849 A (BROWNE) 4 February 1997	1 - 11																				
A	US 5706822 A (KHAVARI) 13 January 1998	1 - 11																				
<input checked="" type="checkbox"/> Further documents are listed in the continuation of Box C <input checked="" type="checkbox"/> See patent family annex																						
<p>* Special categories of cited documents:</p> <table border="0"> <tr> <td>"A"</td> <td>document defining the general state of the art which is not considered to be of particular relevance</td> <td>"T"</td> <td>later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention</td> </tr> <tr> <td>"E"</td> <td>earlier application or patent but published on or after the international filing date</td> <td>"X"</td> <td>document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone</td> </tr> <tr> <td>"L"</td> <td>document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)</td> <td>"Y"</td> <td>document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art</td> </tr> <tr> <td>"O"</td> <td>document referring to an oral disclosure, use, exhibition or other means</td> <td>"&"</td> <td>document member of the same patent family</td> </tr> <tr> <td>"P"</td> <td>document published prior to the international filing date but later than the priority date claimed</td> <td></td> <td></td> </tr> </table>			"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention	"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone	"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art	"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family	"P"	document published prior to the international filing date but later than the priority date claimed		
"A"	document defining the general state of the art which is not considered to be of particular relevance	"T"	later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention																			
"E"	earlier application or patent but published on or after the international filing date	"X"	document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone																			
"L"	document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)	"Y"	document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art																			
"O"	document referring to an oral disclosure, use, exhibition or other means	"&"	document member of the same patent family																			
"P"	document published prior to the international filing date but later than the priority date claimed																					
Date of the actual completion of the international search 7 February 2002		Date of mailing of the international search report 11 FEB 2002																				
Name and mailing address of the ISA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929		Authorized officer J.W. THOMSON Telephone No : (02) 6283 2214																				

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU01/01430

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5868578 A (BAUM) 9 February 1999	1 - 11
A	US 5890997 A (ROTH) 6 April 1999	1 - 11
A	US 5921891 A (BROWNE) 13 July 1999	1 - 11
A	US 6002982 A (FRY) 14 December 1999	1 - 11
A	US 6042492 A (BAUM) 28 March 2000	1 - 11

INTERNATIONAL SEARCH REPORT

International application No.

PCT/AU01/01430

Box I Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos :
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos :
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☐ Claims Nos :
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a)

Box II Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

Claims 1 to 11 all relate to a computer-based system for training a sports participant. The special technical feature is maintaining and modifying a computer data base of a training schedule that is applied to a participant.

Claims 12 to 14 defines a method of training a jockey which is not computer based.

Claim 15 to 19 defines a method of assessing the form of a race horse. It does not involve training or conditioning the participant (horse).

Claims 20 and 21 relate to measuring business and private use of motor vehicles. It has no training or sporting links.

Accordingly, the application claims four quite distinct inventions sharing no special technical feature.

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:
1 - 11

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/AU01/01430

This Annex lists the known "A" publication level patent family members relating to the patent documents cited in the above-mentioned international search report. The Australian Patent Office is in no way liable for these particulars which are merely given for the purpose of information.

Patent Document Cited in Search Report			Patent Family Member		
US	5410472	EP	667970	WO	9410634
US	5598849	EP	657050	WO	9402904
US	5706822	NONE			
US	5868578	US	6042492		
US	5890997	NONE			
US	5921891	AU	46602/96	WO	9626495
US	6002982	US	6148262		
US	6042492	US	5868578		
END OF ANNEX					